



(PHASES 1 & 2)

NORTH WEST SHELF PROJECT

Engineering Heritage International Marker
Award Ceremony



North West Shelf Project

North West Shelf Project Visitors Centre
Burrup Road, Karratha WA
Wednesday 2 August, 2017



PROGRAM

Brian Haggerty

Vice President Innovation Capability, Woodside

Acknowledgement of Traditional Ownership of Land, formal welcome, recognition of distinguished guests and apologies.

James Westcott

President of Engineers Australia Western Australian Division

Engineers Australia Engineering Heritage Recognition Program and award of the Engineering Heritage International Marker.

Mr Kevin Michel MLA

Member for Pilbara

Significance of the North West Shelf Project to the community of Western Australia.

Unveiling of Engineering Heritage Australia Interpretation Panel

Brad Russell-Lane

CEO North West Shelf

Acceptance of Engineering Heritage International Marker.

Brian Haggerty

Vice President Innovation Capability, Woodside

Closing remarks.

The Ceremony will be followed by a morning tea served in the North West Shelf Project Visitors Centre

NORTH WEST SHELF PROJECT (PHASES 1 & 2)

History

The North Rankin, Goodwyn and Angel gas fields were discovered in 1971 and 1972. These gas fields are located 130 kilometres north-west of Dampier in 125 metre water depth. The technical and engineering challenges facing development of these remote gas fields were significantly greater than anything faced by earlier offshore developments in Australia. Only the creation of a new Australian Liquefied Natural Gas (LNG) export industry could make the development of these large gas fields economically viable.

Phase 1 of the North West Shelf (NWS) Project was constructed between 1980 and 1984. This phase included the North Rankin A offshore drilling and production platform, a large one metre diameter submarine pipeline from the platform to the Burrup Peninsula, the King Bay Support Facility, the Karratha Gas Plant and facilities for export of residual condensate. In parallel with Phase 1, the Western Australian Government constructed the 1,530 kilometre long Dampier to Bunbury Natural Gas Pipeline. Phase 2, constructed between 1985 and 1989, included two LNG processing trains, storage tanks, export wharf facilities and six LNG tankers.

With Phase 1 and 2 investments of \$7.1 billion and a total investment of more than \$34 billion since the late 1970s, the NWS Project is one of the largest resource development projects in Australian history. At the time of construction, it was the largest engineering project underway worldwide in the oil and gas industry. Including additional phases, current capacity of the NWS Project is 46,000 tonnes per day of LNG for export, 12,600 tonnes per day of gas for Western Australia and 10,000 tonnes per day of condensate. Present day capacity is now four times larger compared to Phase 2 capacity in 1989.

ACHIEVEMENTS

Significant achievements during Phases 1 and 2 include:

- development of new information for the Pilbara and offshore region on meteorology, cyclones, ocean currents, seabed foundation materials and topography;
- planning, design and construction of the largest capacity offshore gas and condensate platform in the world at that time;
- introducing a step change for LNG plant design from seawater-cooled to air-cooled facilities and from steam turbines to gas turbines;
- overcoming foundation problems associated with the carbonate sediments encountered on the North West Shelf and sharing this experience with industry;
- development of new design criteria and operational procedures for the transfer of both liquids and gas through the single submarine pipeline from North Rankin A platform;
- demonstration of a new standard for Australia in the management of safety and quality throughout all stages of the NWS Project;
- establishment of long-term domestic gas supply and LNG export contracts; and
- cementing the NWS Project's reputation as a reliable provider of domestic gas and exporter.

PROJECT DATA

Project name	North West Shelf Project (NWS Project) – Phases 1 and 2
Owners	<p>Domestic Gas Project – Phase 1</p> <p>North West Shelf Gas Pty Ltd (“NWSGPL”) oversees the domestic gas marketing activities of the project.</p> <p>NWS LNG Project – Phase 2</p> <ul style="list-style-type: none">• The six participants in the NWS Project are:• BHP Billiton Petroleum (North West Shelf) Pty Ltd• BP Developments Australia Pty Ltd• Chevron Australia Pty Ltd• Japan Australia LNG (MIMI) Pty Ltd• Shell Australia Pty Ltd• Woodside Energy Pty Ltd (Woodside) <p>CNOOC is also a participant in the NWS Project but does not have an interest in its asset infrastructure.</p> <p>Woodside is the project operator of both ventures on behalf of the other participants.</p>
Current use	<ol style="list-style-type: none">1. Export of up to 16.9 Mtpa (46,000 tonnes per day) of LNG predominantly to Asia.2. Supply of pipeline specification natural gas into the Dampier to Bunbury Natural Gas Pipeline to the south-west of Western Australia at a rate of up to 12,600 tonnes per day.3. Export of condensate at the rate of up to 10,000 tonnes per day.4. Export of LPG at an average rate of 1,500 tonnes per day.
Designer	Various. Managed by Woodside with technical advice from Royal Dutch Shell.
Builder	Many thousands of people contributed to the development of the NWS Project. There were hundreds of contractors and suppliers and a list of contracts valued at \$20 million and over is available in Woodside’s publication titled ‘Beyond the Flame’, page 134.

Year started	1971 – Offshore hydrocarbon discovery at North Rankin 1978/9/80 – Preliminary engineering – Phase 1 works 1980/84 – Detailed engineering and construction – Phase 1 1985/89 – Detailed engineering and construction – Phase 2	
Year completed	Phase 1 – 1984 Phase 2 – 1989 Phase 3 – 1993 Phase 4 – 1999 Phase 5 – 2008	
Physical description	Phase 1 – Domestic gas <ul style="list-style-type: none"> • Initial offshore production platform (“NRA”) located over the North Rankin Field. • Pipeline from NRA to shore near Withnell Bay in Mermaid Sound. • Onshore production facilities to provide pipeline specification gas for the Western Australian market. • Condensate storage and export facilities. • Offshore supply base and tug pens at King Bay and an adjacent materials offloading facility to support onshore construction together with general cargo and fuel imports. • Housing and other facilities in Karratha for Woodside personnel during the construction and operations phases. Phase 2 – LNG export <ul style="list-style-type: none"> • Two LNG production trains for LNG export at the Karratha Gas Plant. • Storage and export facilities for LNG. • Six LNG carriers. 	
Modifications and dates	1992	Modification of LNG trains 1 and 2 to improve production rates to 2.5 Mt per year each (aggregate total 5 Mtpa).
	1993	Addition of a 3rd LNG production train at a rate of 2.5 Mt per year (7.5 Mtpa).
	1995	Addition of a 2nd offshore production facility over the Goodwyn Field (GWA).
	1995	Installation of Cossack Pioneer FPSO over Wanaea-Cossack fields with oil production of 6 kt per day.

Modifications and dates	1996	Addition of a LPG plant, storage and export facilities at Withnell Bay.
	2004	Addition of a 4th LNG production train at a rate of 4.4 Mt per year (11.9 Mtpa).
	2004	Installation of second parallel pipeline from NRA to Withnell Bay.
	2008	Addition of a 5th LNG production train at a rate of 4.4 Mt per year (16.3 Mtpa).
	2009	Installation of 3rd platform at Angel location and pipeline to NRA.
	2011	Replacement of Cossack Pioneer FPSO with Okha FPSO with heavy gas pipeline to NRA.
	2013	Completion of the North Rankin Redevelopment Project including installation of NRB platform adjacent to and bridge- connected to NRA.
	2015	First production from the Greater Western Flank Phase 1 Project.
Engineering Excellence awards	1990	The North Rankin A Platform Foundations Project was awarded the inaugural Sir William Hudson Award for the best engineering project in Australia.
	1992	The Trunkline Remedial Stabilisation Project was awarded a WA engineering excellence award.
	1993	The Remote Offshore Warning System was awarded a WA engineering excellence award and the Pipeline Emergency Isolation System was highly commended.
	1994	Both the Goodwyn A platform remedial works and the North Rankin reliability upgrade were awarded WA engineering excellence awards.
	2015	The North Rankin Redevelopment Project was awarded a WA engineering excellence award.

